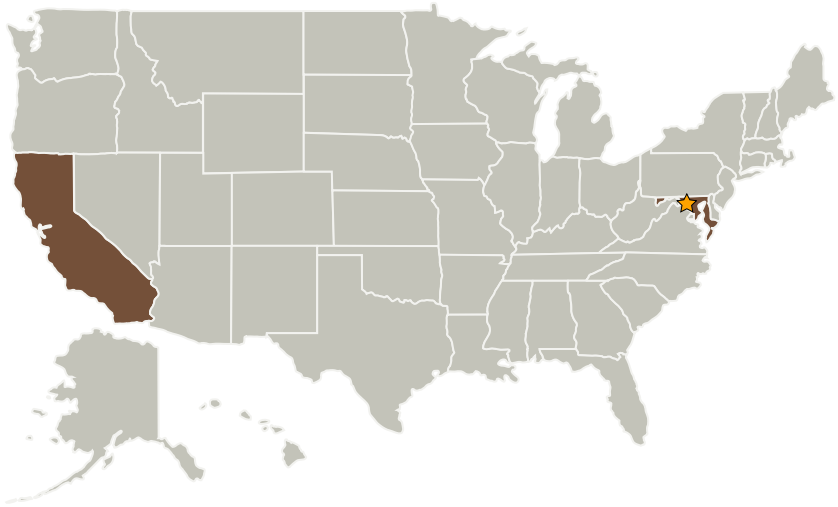
Integrated Circulator for Regenerative Cryocoolers, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

Future instruments and platforms for NASA space applications will require increasingly sophisticated thermal control technology, and cryogenic applications will become increasingly more common. For example, the Single Aperture Far-IR (SAFIR) telescope and other cryogenic telescope missions must provide distributed cooling and multiple heat lift. Also, the management of cryogenic propellants requires distributed cooling through integrated heat exchangers for zero boil-off, densification and cooling of structural members. To address these requirements, we propose to develop a lightweight, continuous-flow cooling loop that can provide cooling and temperature control to multiple, distributed loads. This approach allows relatively simple mechanical and electrical integration and maintains high refrigeration system efficiency. The basis of the loop is a rectifying interface that converts the oscillating pressure that characterizes the operation of a regenerative cryocooler into a quasi-steady pressure difference that can be used to drive a continuous flow of cold gas over distances of several meters. The rectifying interface has the potential secondary benefit of rapid and therefore precise load temperature regulation of multiple sensors or structures using actively controlled throttle valves to regulate the local gas flow.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Atlas Scientific	Supporting Organization	Industry	San Jose, California

Primary U.S. Work Locations	
California	Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors